Base Realignment and Closure (BRAC) Cleanup Team Workshop

Monitored Natural Attenuation

Lisa Price
U.S. EPA Region 6
1445 Ross Avenue, Dallas, TX 75202

Use of Monitored Natural Attenuation (MNA)

EPA's Policy for CERCLA, RCRA, and UST Sites

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U.S. EPA OSWER Directive 9200.4-17

NCP

- *The selection of natural attenuation by EPA does not mean that the ground water has been written off and not cleaned up but rather that biodegradation, dispersion, dilution, and adsorption will effectively reduce contaminants in the ground water to concentrations protective of human health in a timeframe comparable to that which could be achieved through active restoration...*

Definition - What It Is

- Naturally-occurring processes that act to reduce the mass, toxicity, mobility, volume or concentration of contaminants

Processes - How It Works

- Biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants

How Risk May Be Reduced By Natural Attenuation

- Contaminant converted to less toxic form
- Exposure concentrations may be less
- contaminant mobility and bioavailability may be reduced

Advantages

- Less remediation waste generated and/or transferred
- Less intrusive
- May be applied to all or part of a site
- May be used with or as follow-up to other (active) remedial actions
- May be cheaper

Disadvantages

- Longer time to achieve remedial objectives and/or goals
- More complex and possibly more costly site characterization
- Transformation products may be more toxic
- Responsibility for longer monitoring, including costs

Disadvantages (cont.)

- Institutional controls may be necessary
- Potential for continued contaminant migration and/or cross-media transfer
- Changes in hydrogeochemical conditions that could result in remobilization of “stabilized” contaminants
- More community outreach to gain acceptance

Role of MNA

- May be appropriate for actions under UST, RCRA, and Superfund programs
- Is not a default or presumptive remedy
- Should be considered along with other remedial approaches or technologies
- Should be evaluated as remedial component, not solely as stand-alone remedy

Role of MNA (cont.)

- “Principal threats” (source) need to be addressed
- Contaminated groundwaters should be returned to their beneficial uses
- Contaminated soil should be remediated to prevent transfer of contaminants

Demonstration of Efficacy of MNA

Decision to select MNA

MUST BE

thoroughly and adequately

SUPPORTED

with site-specific characterization data

and analysis

Demonstration of Efficacy of MNA (cont.)

Site Characterization:

- Nature, extent, and distribution of contamination
- Extent of groundwater plume
- Preferential groundwater flow pathways
- Potential impact to receptors
- Impact of ongoing or proposed remedial actions

Demonstration of Efficacy of MNA (cont.)

Conceptual Site Model:

- Release mechanisms
- Nature, extent, character of source material
- Transport and fate of contaminants
- Characterization of processes (e.g. microbial Populations, nutrients, electron donors, etc.)
- Process rates, timescales (e.g. attenuation rate vs. contaminant transport rate)

Demonstration of Efficacy of MNA (cont.)

"Evidence" after site characterization and conceptual site model :

1) historical groundwater and/or soil chemistry data that shows NA **IS** working

2) hydrogeologic and geochemical data that shows (indirectly) NA **CAN** work

3) field or microcosm studies that show (directly) NA **CAN** work

Where MNA Is Appropriate

- Will be protective of human health and the environment;
- Can achieve site-specific remediation objectives; **and**,
- Within a reasonable timeframe compared to other alternatives

Where MNA Is NOT Appropriate

- Where plume is not stable OR
- Where there is unacceptable risk posed to human and environmental receptors

Reasonableness of Remediation Time Frame

- Evaluated and decided on a site-specific basis
- Timeframes estimated for **ALL** remedy alternatives (i.e., absolute NOT relative)
- Timeframes must be compatible with land and groundwater use
- Comprehensive State Groundwater Protection Program should be consulted

Remediation of Sources/Highly Contaminated Areas

- Evaluation of source control measures critical if MNA is being considered
- Expectation that source control measures will be implemented where practicable
- Expectation for source area containment when full restoration is not practicable

Remediation of Sources/Highly Contaminated Areas (cont.)

- Control measures can include: removal, in-situ treatment, or stabilization of contaminated soils; extraction of subsurface NAPLs; physical or hydraulic control of groundwater contamination from NAPLs; capping or other leachate mitigation

Remediation of Sources/Highly Contaminated Areas (cont.)

HINT: ***Control of source materials is the most effective means of ensuring the timely attainment of remedial objectives***

Performance Monitoring of MNA

- Demonstrate NA is occurring as expected
- Identify toxic transformation products and/or mobilized inorganics
- Access plume stability/migration
- Ensure no impact to downgradient receptors

Performance Monitoring of MNA (cont.)

- Detect new releases
- Determine efficacy of institutional controls
- Detect changes in environmental conditions
- Verify attainment of remediation goals

When It Isn’t Working

- Increase in concentrations
- Detection of contaminants outside of known plume boundary
- Rate of decrease is not as expected
- Changes in land and/or groundwater use

Contingency Remedies

- “Backup” remedy if selected remedy fails to perform as expected
- Specified in the site remedy decision document
- May specify different technology or may call for modification or enhancement of the originally selected remedy

Contingency Remedies (cont.)

- EPA recommends that where MNA is being evaluated other alternatives that could achieve remedial objectives should also be evaluated

MNA Case Studies

- Not appropriate at all sites
- MNA may be more effective when used in conjunction with an “active” remedy
- Rule of Thumb: MNA may be appropriate for 80% of the petroleum sites but may be appropriate for only 20% of the CVOC sites without source control